Application No. 10/809,120
Amendment Dated: 12 June 2008
Reply to Office Action of 14 March 2008

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1. (Original) A system for quantifying blood flow in a living subject comprising:

   (a) a thermal energy source for increasing blood temperature at a location in the venous side of the circulatory system during preselected time intervals;

   (b) a first sensor for sensing blood temperature in the venous side of the circulatory system where blood temperature is substantially unaffected by the output of the thermal energy source;

   (c) a second sensor for sensing blood temperature in the arterial blood flow path where the blood temperature is affected by the output of the thermal energy source; and

   (d) means responsive to the first and second sensors and output of said thermal energy source for calculating a blood flow related value as a function of outputs of the first and second sensors when blood temperature in the arterial side of the circulatory system is affected by output of said thermal energy source and the outputs of the first and second sensors when blood temperature in the arterial side of the circulatory system is not substantially affected by said thermal energy source.

2. (Original) A system according to Claim 1 further comprising a catheter adapted to be introduced into the venous system for supporting one or both of the first sensor and the thermal energy source.

3. (Currently amended) A system ~~according to Claim 2 further comprising~~ for quantifying blood flow in a living subject comprising:

(a) a thermal energy source for increasing blood temperature at a location in the venous side of the circulatory system during preselected time intervals;

(b) a first sensor for sensing blood temperature in the venous side of the circulatory system where blood temperature is substantially unaffected by the output of the thermal energy source;

(c) a catheter adapted to be introduced into the venous system for supporting one or both of the first sensor and the thermal energy source;

(d) a second sensor for sensing blood temperature in the arterial blood flow path where the blood temperature is affected by the output of the thermal energy source;

(e) a second catheter adapted to be introduced into the arterial system for supporting the second sensor; and

(f) means responsive to the first and second sensors and output of said thermal energy source for calculating a blood flow related value as a function of outputs of the first and second sensors when blood temperature in the arterial side of the circulatory system is affected by output of said thermal energy source and the outputs of the first and second sensors when blood temperature in the arterial side of the circulatory system is not substantially affected by said thermal energy source.

4. (Original) A system according to Claim 3 wherein said calculating means comprises means for (i) determining the difference in the temperatures sensed by the first and second sensors when the blood temperature in the arterial side of the circulatory system is affected by output of the thermal energy source; (ii) determining the difference in the temperatures sensed by the first and second sensors when the blood temperature in the arterial side of the circulatory system is substantially unaffected by output of the thermal energy source and (iii) calculating blood flow as a function of the difference between said differences.

5. (Original) A system according to Claim 1 wherein said calculating means comprises means for calculating blood flow as a function of the output of the thermal energy source and the difference between

the temperature difference sensed by the first and second sensors when the blood temperature in the arterial side of the circulatory system is affected by output of the thermal energy source and

the temperature difference sensed by the first and second sensors when the thermal energy source is not activated.

6. (Original) A system according to Claim 1 wherein the thermal energy source comprises an energy source for increasing blood temperature in or near the right atrium or vena cava and said calculating means calculates a blood flow value that corresponds to cardiac output.

7. (Original) A system for quantifying blood flow in the circulatory system of a living subject comprising:

(a) heating means adapted to be located in the venous flow path for intermittently elevating the temperature of blood in the arterial flow path;

(b) means for sensing blood temperature in the arterial flow path;

(c) means for providing a value corresponding to blood temperature at a location in the venous flow path not affected by the output of said heating means; and

(d) means for calculating blood flow as a function of the output of said heating means when elevating blood temperature, the difference in the values from said sensing means and said providing means when the temperature of blood is not elevated by said heating means and the difference in the values from said sensing means and said providing means when the temperature of blood is elevated by said heating means.

8. (Original) A system according to claim 7 wherein said providing means comprises a second means for sensing blood temperature.

9. (Original) A method for calculating blood flow in the blood flow path of a living subject comprising:

(a) changing a thermal energy characteristic of blood at a site in the venous side of the circulatory system in or near the right atrium or vena cava during preselected time intervals;

(b) detecting the temperature difference between a location in the venous system substantially unaffected by said changes introduced at the site and a selected location in the arterial system where blood temperature is affected by said changing step;

(c) detecting the temperature difference between the location in the venous system and the location in the arterial system in the absence of said changing step; and

(d) calculating blood flow as a function of the temperature difference of the first said detecting step, the temperature difference of the second said detecting step and the change introduced by said changing step.